

Slow-transit constipation and criteria for colectomy: a cross-sectional study of 1568 patients

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Abstract

Background: Colectomy remains a treatment option for a minority of patients with slow-transit constipation (STC) refractory to conservative treatment. However careful patient selection is essential to maximize benefits and minimize risk of adverse outcome. This study determined the proportion of patients with chronic constipation that would meet criteria for colectomy based on recent European graded practice recommendations derived by expert consensus.

Methods: Retrospective application of graded practice recommendations was undertaken on a prospectively maintained data set of consecutive adult patients with chronic constipation who underwent whole-gut transit studies using radio-opaque markers. Primary analysis applied contraindications achieving high level of expert consensus (normal whole-gut transit as an absolute contraindication and faecal incontinence as a relative contraindication for colectomy). Secondary analysis applied contraindications with less certain consensus.

Results: Primary analysis of 1568 patients undergoing a whole-gut transit study between January 2004 and March 2016 found 208 (13.3 per cent) met published criteria to be selected for colectomy, with 974 excluded for normal whole-gut transit and 386 for faecal incontinence. Secondary analysis demonstrated high prevalence of other relative contraindications to colectomy: 165 concomitant upper gastrointestinal symptoms, 216 abdominal pain (including 126 irritable bowel syndrome), and 446 evacuation disorder. The majority of patients (416 of 594) had two or more relative contraindications. If these patients were excluded, only 26 (1.7 per cent) chronically constipated patients retrospectively met selection criteria for colectomy.

Conclusions: The retrospective application of selection criteria is a limitation. However, the data highlight the high prevalence of factors associated with poor postoperative outcome and provide further caution to surgeons undertaking colectomy for STC.

Introduction

Colectomy remains a treatment option for patients with slow-transit constipation (STC) who have no palliation of symptoms after non-surgical attempts. The concept of shortening a dysmotile large bowel to effect an improvement in symptoms is a long-standing approach¹, but there is a dichotomy between the good results from some single-centre case series²⁻⁴, and those reported by others where outcomes reflect a balance of benefits and significant short- and long-term harms (including some very poor functional outcomes)^{5,6}. Further, there is uncertainty in terms of extent of resection (total or subtotal) and type of anastomosis⁶.

In 2017, a UK-funded programme of research (NIHR CapaCiTY) systematically reviewed all major procedures for patients with chronic constipation. Five reviews, including one focused on colectomy⁶, provided summary evidence statements in regard to benefits and harms based on data synthesis. These were combined to produce graded practice recommendations⁷ derived by European Expert Consensus using Delphi techniques. With the caveat that poor data quality limited firm conclusions, criteria for patient selection (based on the effect of baseline

patient characteristics on surgical outcome) were also documented for all main procedures. These included confirmation of diagnosis (that is, STC) and a number of relative and absolute contraindications (Table S1).

This poses the question of how many patients would be deemed appropriate for consideration for colectomy after such criteria were rigorously applied in practice. The aim of this study was to apply these selection criteria retrospectively to a cohort of consecutive patients referred with chronic constipation to a UK specialist surgical service to determine specifically the proportion of patients with STC and the proportions of patients with absolute or relative contraindications to colectomy based on practice recommendations.

Methods

Design

A prospectively maintained data set of consecutive patients, aged between 18 and 80 years, referred to the Royal London Hospital Gastrointestinal Physiology Unit between January 2004 and March 2016 for investigation of symptoms of bowel dysfunction,

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was analysed retrospectively. The data set consisted of information regarding patients' demography, bowel symptoms, medical and surgical history, obstetric history, current and past medications and quality of life, all collected using a comprehensive bowel symptom questionnaire that also incorporated Rome III criteria for functional constipation and irritable bowel syndrome (IBS)⁸, the Cleveland Clinic constipation⁹ and St Mark's incontinence scores¹⁰. Results of detailed anorectal physiological and structural investigations, including rectal sensation to balloon distension, anorectal manometry, defecography and whole-gut transit studies were also available within the data set. Whole-gut transit studies were performed in those with a history of infrequent defecation. Patients with a primary presenting complaint of constipation, who completed symptom questionnaires and who underwent investigation of whole-gut transit study, were included in the study. The study was qualified as exempt from full Research Ethical Committee review, with local approval being issued (IRAS ID 270602).

Patients' investigations and diagnoses

Whole-gut transit was assessed using a plain abdominal radiograph 100 hours following ingestion of capsules containing 50 1-mm polyethylene markers. Patients were defined as having delayed whole-gut transit (STC) if 20 per cent or more of the markers were retained at the time of the radiograph¹¹.

Self-reported questionnaire responses included abdominal pain, scored according to frequency (never, rarely, sometimes, usually and always)⁹ and severity, using a visual analogue scale (from 0 to 10, where 0 = none at all and 10 = severe). IBS was classified using the Rome III criteria for IBS⁸. Concomitant upper gastrointestinal symptoms (bloating, allied to nausea or vomiting) were also scored according to reported frequency and severity (similar to above). Diagnosis of concomitant evacuation disorder was based on results of barium defecography, performed in accordance with a previously published protocol¹². Evacuation disorders may be 'functional' or structural, with the former defined by incomplete (less than 60 per cent) or prolonged (more than 150 seconds) expulsion of instilled neostool¹² in the presence of poor opening of the anorectal angle, poor relaxation of the anal canal, or poor expulsive force generated. Structural anomalies include significant intussusception (Oxford 3–5 or obstructing Oxford 1–2)¹³, 'trapping' rectocele (greater than 4 cm depth or 2–4 cm with stool trapping and symptomatic)^{12,13}, enterocele¹³, excessive dynamic perineal descent (greater than 3.5 cm)¹³, and megarectum (rectal diameter greater than 8.1 cm in men and greater than 6.9 cm in women)¹². Faecal incontinence (FI) was graded using the St. Mark's incontinence score¹⁰. A score of 6 or higher was considered to demonstrate significant incontinence¹⁴. Diagnosis of a functionally impaired sphincter was made based on anorectal manometry. Assessments performed prior to 2013 utilized a station pull-through technique using a water-perfused manometric system (see previously published protocol and normal values from healthy subjects)¹⁵. Assessments performed thereafter used a high-resolution anorectal manometry system (see previously published protocol and normal values from healthy subjects)¹⁶. Impaired sphincter function was defined as anal hypotonia (resting tone below the lower limit of normal) or voluntary anal hypocontractility (squeeze pressure below the lower limit of normal)¹⁷. Upper gastrointestinal physiology studies (e.g. gastric emptying studies, prolonged small bowel manometry) were not routinely performed and have not been included as a criterion in this study.

Patients with chronic constipation who meet published selection criteria for colectomy

Patients with contraindications to colectomy were serially excluded based on their response to the bowel symptom questionnaire and anorectal physiology results. Using the European graded practice recommendations⁷ with a Delphi decision of 'appropriate' (based on unanimity or near unanimity of consensus), the following were applied as exclusion criteria in the primary analysis:

- Unproven delay in whole-gut transit (absolute)
- Faecal incontinence and/or functionally impaired anal sphincter (relative).

Recommendations with a Delphi decision of 'uncertain' (based on majority consensus) were applied as exclusion criteria in the secondary analysis:

- Concomitant significant upper gastrointestinal symptoms (relative)
- Significant symptoms of abdominal pain and bloating (including diagnosis of IBS) (relative)
- Concomitant untreated evacuation disorder (structural or functional) (relative).

In addition, it was also recognized that patients who, having passed these criteria, might be excluded for other published reasons, such as major psychiatric diagnosis^{18–20}, regular use of opioid analgesia^{21–23}, major neurological disease^{21,22}, panenteric and biliary dysmotility^{24,25} and autonomic neuropathy^{24,25}.

Statistical analysis

Descriptive statistics were used to summarize patient characteristics. Continuous and ordinal variables were described using medians with interquartile ranges, and comparisons between two groups made using Mann-Whitney *U* test. Categorical variables were described by proportions using percentages, and comparisons between groups made using χ^2 test. Grey-scale matrices representing proportion of patients reporting Cleveland Clinic Constipation Score (CCCS) and the number of relative contraindications were created using Microsoft Excel 2016. All statistical analyses were performed using proprietary software (IBM SPSS Statistics for Windows, version 25; IBM Corp., Armonk, N.Y., USA). Small incidences of missing data (such as illegible entry or contradicting responses) were excluded from individual analysis, but not considered an exclusion criterion from the whole study.

Results

Patients

Between January 2004 and March 2016, 1568 patients with symptoms of chronic constipation and a history of infrequent defecation underwent a whole-gut transit radio-opaque marker study, and also completed the bowel symptom questionnaire fully (Table 1). Overall, 974 (62.1 per cent) patients had normal whole-gut transit, and 594 (37.9 per cent) had delayed whole-gut transit (STC). The proportion of female patients was higher in the STC group compared with those with normal transit (542 of 594 patients (91.2 per cent) versus 851 of 974 (87.4 per cent), respectively; $P=0.018$), otherwise demographics were similar in both groups. Fewer patients in the STC group reported a history of previous anal or perineal surgery (88 of 594 patients (14.8 per cent) versus 187 of 974 (19.2 per cent), respectively; $P=0.027$), but a

Table 1. Patient characteristics

Patient characteristics	Normal transit(n = 974)	STC(n = 594)	P [¶]
Sex			
Female	851 (87.4)	542 (91.2)	0.018
Male	123 (12.6)	52 (8.8)	
Age (years)*	49 (37–58)	49 (37–59)	0.808 [#]
Parity			
Nulliparous	206 (24.2)	120 (22.1)	0.374
Parous	645 (75.8)	422 (77.9)	
Number of deliveries [†]			
1	113 (17.5)	61 (14.5)	
2	292 (45.3)	193 (45.7)	
3	137 (21.2)	94 (22.3)	
4 or more	103 (16.0)	74 (17.5)	
Traumatic vaginal delivery [†]	474 (73.5)	311 (73.7)	0.940
Instrumental delivery [†]	148 (22.9)	101 (23.9)	0.709
Caesarean section [†]	113 (17.5)	79 (18.7)	0.618
Surgical history			
Abdominal or bowel surgery	278 (28.5)	165 (27.8)	0.744
Pelvic surgery, including hysterectomy	344 (35.3)	243 (40.9)	0.026
Rectal surgery	71 (7.3)	36 (6.1)	0.349
Anal or perineal surgery	187 (19.2)	88 (14.8)	0.027
Rome III core criteria for functional constipation[‡]			
Straining	779 (80.0)	527 (88.7)	<0.001
Lumpy or hard stool	175 (18.0)	244 (41.1)	<0.001
Incomplete evacuation	895 (91.9)	554 (93.3)	0.318
Anorectal obstruction	701 (72.0)	488 (82.2)	<0.001
Manual manoeuvres	377 (38.7)	263 (44.3)	0.029
<3 defecations per week	365 (37.5)	413 (69.5)	<0.001
Cleveland Clinic constipation score [§]			
Score*	16 (12–19)	19 (15–22)	<0.001[#]
Frequency of bowel movement ≤1 per week	186 (19.1)	278 (46.8)	<0.001
Painful evacuation effort	676 (69.4)	468 (78.8)	<0.001
Incomplete evacuation	895 (91.9)	554 (93.3)	0.318
Abdominal pain	713 (73.2)	478 (80.5)	0.001
>10 minutes in lavatory per attempt	462 (47.4)	341 (57.4)	<0.001
Assistance for defecation	597 (61.3)	420 (70.7)	<0.001
>3 unsuccessful attempts per 24 hr	656 (67.4)	488 (82.2)	<0.001
Duration of constipation >5 years	573 (58.8)	413 (69.5)	<0.001

Values in parentheses are percentages unless indicated otherwise; *values are median (i.q.r.). [†]Of parous females. [‡]25 per cent or more of defecations. [§]Proportion of patients with a score of 2 or more per symptom category. [¶] χ^2 test, except [#]Mann–Whitney U test.

history of pelvic surgery, including hysterectomy, was greater in the STC group (243 of 594 patients (40.9 per cent) versus 344 of 974 (35.3 per cent), $P=0.026$). Parity, obstetric history and other surgical history were similar in both groups. Except for symptom of incomplete evacuation, patients with STC were more likely to report all domains of constipation symptoms according to both Rome III core criteria for functional constipation and the CCCS compared with those with normal transit. Total CCCS was therefore higher in the STC group (median 19 (i.q.r. 15–22) versus 16 (i.q.r. 12–19), $P<0.001$).

Primary analysis

Patients with chronic constipation who met published selection criteria for colectomy with an ‘appropriate’ consensus decision are shown in Table 2. Almost two thirds of patients with chronic constipation demonstrated normal whole-gut transit (62.1 per cent), which is an absolute contraindication for colectomy. Amongst the 594 patients with proven transit delay, a further 386 patients (65.0 per cent) had a relative contraindication for colectomy, with 330 (55.6 per cent) reporting significant symptoms of faecal incontinence and 187 (31.5 per cent) demonstrating impaired anal sphincter function on manometry. A sequential selection process for consideration of colectomy is shown using a flow diagram, which demonstrates that only 13.3 per cent (208 out of 1568 patients) remained appropriate for consideration for colectomy (Fig. 1).

Secondary analysis

The prevalence of other relative contraindications to colectomy is shown in Table 3. When relative contraindications with ‘uncertain’ consensus were considered, the majority of patients with STC (416 of 594 patients, 70.0 per cent) had two or more relative contraindications, mainly based on severe and frequent abdominal pain and concomitant upper gastrointestinal symptomatology (Fig. S1). Patients with STC demonstrated a high prevalence of abdominal pain of any severity or frequency (557 of 594 patients, 93.8 per cent), with 216 (36.4 per cent) experiencing severe (VAS of 8 or higher) and frequent (usually, always) symptoms. The prevalence of concomitant upper gastrointestinal symptoms of any severity or frequency were also high (407 of 594 patients, 68.5 per cent), with 165 (27.8 per cent) experiencing severe and frequent symptoms. However only 126 (21.2 per cent) of these patients met the diagnostic criteria for IBS. Evacuation disorders were also frequent (446 of 594 patients, 75.1 per cent), with 169 (28.5 per cent) demonstrating a functional evacuation disorder and 356 (59.9 per cent) demonstrating a structural evacuation disorder. Co-existing functional and structural evacuation disorders were found in 79 patients (13.3 per cent). Linear regression showed a moderate but significant association between the severity of constipation (CCCS) and the number of relative contraindications ($B=0.369$ (95 per cent c.i. 0.061 to 0.093); $P<0.001$; $r^2=0.136$; see Fig. S2).

Table 2. Prevalence of contraindications to colectomy with 'appropriate' Delphi consensus

Absolute contraindications	Frequency
Unproven generalized delay in colonic transit (normal whole-gut transit)	974 (62.1)
Relative contraindications	Frequency
Faecal incontinence or impaired sphincter function	386 (65.0)*
Incontinence or impaired anal sphincter function	330 (55.6)*
Incontinence (St. Mark's incontinence score >5)	187 (31.5)*
Impaired anal sphincter function (anal hypotonia or hypocontractility)†	

Values in parentheses are percentages. *Percentage of patients with slow transit constipation. †Normal values from healthy subject previously published by Carrington et al.¹⁶

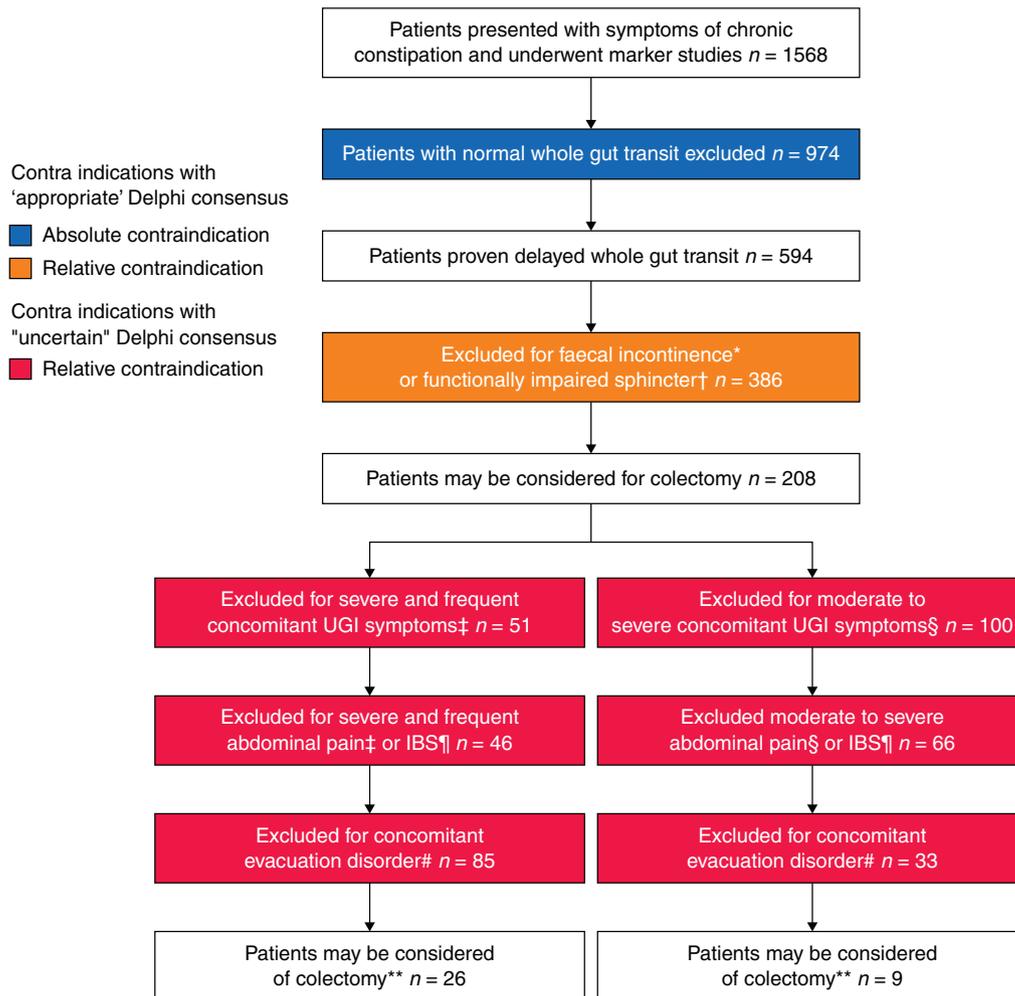


Fig. 1 Patient selection for colectomy

*St Mark's incontinence score of >5. †Anal hypotonia or voluntary hypocontractility on anorectal manometry. ‡Severity of 8 or more AND frequency of 3 (usually) or 4 (always). §Severity of 4 or more AND frequency of 2 (occasionally) or above. ¶Rome III criteria for diagnosis of IBS. #Defecographic diagnosis of functional evacuation disorder, significant intussusception, rectocele, enterocele, excess perineal descent and megarectum. **Information on concomitant upper gastrointestinal (UGI) symptoms or proven UGI dysmotility not captured

Following the inclusion of these relative contraindications in the sequential selection process for consideration of colectomy (Fig. 1), only 26 patients (4.4 per cent of STC patients, 1.7 per cent of all patients with chronic constipation) remained appropriate for consideration for colectomy. Of these, seven patients had secondary causes (opiate analgesia, concurrent psychiatric disorder requiring medication, or significant neurological diagnosis) which may preclude them from consideration for surgery. If a 'lower' bar was applied for exclusion based on severity and frequency of abdominal pain and bloating (VAS of 4 or above and frequency of

sometimes or more often), only nine patients (1.5 per cent of STC patients, 0.6 per cent of all patients) would have been considered appropriate for surgery with three having secondary concerns.

Discussion

This study demonstrates that of a large starting denominator of 1568 patients with chronic constipation (severe enough to warrant referral to a specialist centre), only a small proportion (208 of 1568, 13.3 per cent) would retrospectively meet published

Table 3. Prevalence of contraindications to colectomy with ‘uncertain’ Delphi consensus

Relative contraindications		Frequency
Concomitant upper gastrointestinal symptoms (bloating, nausea, vomiting)	All severity and frequency	407 (68.5)
	Moderate to severe: severity >4, frequency 2 (occasionally) or more	317 (53.4)
	Severe: severity >8, frequency 3 (usually) or 4 (always)	165 (27.8)
Abdominal pain including diagnosis of IBS	All severity and frequency	557 (93.8)
	Moderate to severe: severity >4, frequency 2 (occasionally) or more	462 (77.8)
	Severe: severity >8, frequency 3 (usually) or 4 (always)	216 (36.4)
Evacuation disorders	IBS (Rome III)	126 (21.2)
	All evacuation disorders (functional, structural or both)	446 (75.1)
	Functional evacuation disorder (<60% evacuated in >150 seconds)*	169 (28.5)
	Structural evacuation disorders	356 (59.9)
	Significant intussusception (Oxford 3–5 or obstructing Oxford 1–2)†	168 (28.3)
	Significant rectocele (>4 cm or 2–4 cm with stool trapping and symptomatic)*†	184 (31.0)
	Enterocolocele	53 (8.9)
	Excessive dynamic perineal descent (>3.5 cm)†	44 (7.4)
Megarectum (>6.9 cm in female, >8.1 cm in male)*	61 (10.3)	

Values in parentheses are percentages of patients with slow transit constipation. *Normal values from healthy subject previously published by Palit et al.¹². †Normal values from healthy subject previously published by Grossi et al.¹³. Specific diagnosis not captured in questionnaire. IBS, irritable bowel syndrome.

criteria⁷ for colectomy. The prevalence estimate of STC in the patient cohort (594 of 1568, 37.9 per cent) is consistent with previously reported rates (16–80 per cent)^{26–28}. The new finding was the high proportion of patients with STC who have concomitant faecal incontinence or impaired anal sphincter function. Colectomy is associated with a risk of diarrhoea and faecal incontinence regardless of the indication for surgery^{29,30} due to reduced capacity for water absorption³⁰, reduced absorption of biliary acids (if terminal ileum is resected) or bacterial growth in the ileum (if the ileocaecal valve is resected)³⁰. Following colectomy for constipation, problems of diarrhoea and incontinence are well recognized^{20,31,32} and correlate with lower quality of life^{29,30}. Strategies to improve continence outcome included subtotal and segmental resections^{33,34} but these carry an increased risk of ongoing or recurrent constipation^{6,19,33}. Therefore, avoidance of colectomy in patients with pre-existing faecal incontinence or sphincter impairment is considered prudent to minimize the risk of postoperative new or worsening faecal incontinence. The prevalence of faecal incontinence or sphincter impairment among the present cohort was high (65.0 per cent). Although the prevalence of sphincter impairment (identified on manometry) has not been reported previously in the context of STC, the prevalence of faecal incontinence symptoms in patients with constipation has been reported previously by Brochard and colleagues (24.1 per cent)³⁵ and by Carter and colleagues (23 per cent)³⁶. The rate of faecal incontinence was much higher in the present cohort (55.6 per cent), which may be attributable to the use of different diagnostic criteria for faecal incontinence (Cleveland Clinic incontinence score³⁷ and Rome IV criteria for faecal incontinence³⁸ respectively, versus St. Mark’s incontinence score) and variations in the denominator population.

Other relative contraindications with ‘uncertain’ consensus decision⁷ were explored. After colectomy, it is well established that symptoms of abdominal pain^{20,22,31,32,34} and upper gastrointestinal tract dysmotility (bloating, nausea, and vomiting)^{20,22,31,34,39–41} may persist and affect functional outcome and resultant quality of life^{32,39}, even when relief of the constipation

symptoms has been achieved. The presence of an evacuation disorder may also result in persistence of constipation symptoms and poor functional outcome following colectomy for STC^{31,33}. This study demonstrated a very high prevalence of abdominal pain, symptoms of upper gastrointestinal tract dysmotility and evacuation disorder (93.8, 68.5 and 75.1 per cent respectively) amongst patients with STC, which may further restrict the proportion of patients considered suitable for colectomy (26 of 1568, 1.7 per cent). It can also be argued that several published exclusions were not covered by the European consensus because insufficient data existed to do so. Thus, neurological diagnoses^{42,43}, regular use of opiate medications²³, major psychiatric disorders^{6,18–20,33,44} and autonomic neuropathy^{24,25} could be considered further causes for exclusion.

This study has two major limitations. First, it must be acknowledged that the exclusion criteria applied, although derived by several rounds of consensus (of many European experts) are necessarily only as good as the data that underpinned their development – which was poor. In defence, most of the criteria had been well documented previously and accepted worldwide as exclusions for colectomy, but this is still a limitation. Second, although data collection was prospective, robust and standardized, the presented study required the retrospective application of European criteria. On this basis, it was not possible to derive any meaningful analysis of the few individuals within this cohort (a total of 6 patients) who underwent colectomy for chronic constipation due to the lack of information on the reasoning behind decisions to operate and their long-term postoperative outcomes. Also, upper gastrointestinal dysmotility⁶, as well as pancreatic and biliary dysmotility^{24,25}, are other contraindications to colectomy that could not be directly evaluated as upper gastrointestinal physiology studies were not routinely performed in the authors’ chronically constipated patient cohort. In reality, other considerations such as co-morbidities, acceptability of risks associated with major surgery, and patients’ choice, may influence the number of ideal patients further. However, the decision to pursue surgery must be balanced with quality-of-life

considerations given that severe constipation is significantly associated with poor quality of life^{35,45} and, despite the influence of these contraindications, the reported global satisfaction ratings from colectomy are generally high⁶. Other limitations include the highly selective nature of the present sample (single-centre, tertiary referral practice) that might make the results less generalizable to other centres. Despite these limitations, the data provide further caution to surgeons undertaking colectomy for STC. The application of European recommendations to the present patient cohort reinforces previous calls^{19,21,44} for very high selectivity.

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Supplementary material

[Supplementary material](#) is available at *BJS Open* online.

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